# 029

# Three Switches on One RCX Input

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One of the main limitations of the RCX module of the Lego Robotics Invention System is that only one switch can be connected to a given input. Even though each input has a measurement range of 0 to 1023, using an internal 8-bit A/D converter, the software works with only two states for detecting a switch: open and closed.

If you use the standard Lego software, you will have to accept this limitation. However, if you use a different programming language, such as Visual BASIC, it is not that difficult to find a way around it. In fact, the RCX block measures with a resolution of eight bits, even when detecting the state of a switch. If you connect several resistors with different values to the switch input, it is possible to read out several switches using a single input.

The schematic diagram shows that only three resistors are needed for connecting three switches. With the proper choice of resistances, it is possible to detect eight different combinations of switch states. RAW will have the values listed in the table, according the states of the three switches. For a programmer with a bit of experience, it is no problem to cause certain actions to take place according to on these values.

The table lists the (theoretical) values that RAW will have if a single switch or a combination of switches is closed. The more precisely the resistances correspond to the given values, the closer the measured values of RAW will be to the theoretical values. However, with the illustrated arrangement, you can reliably use standard resistors with a tolerance of 5 percent.

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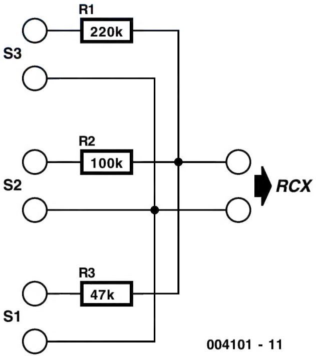

Table 1. Theoretical value of RAW for 8 switch states.

| Switch 1 | Switch 2 | Switch 3 | measured value of RAW |
|---|---|---|---|
| 0 | 0 | 0 | 1 023 – 1 001 |
| 0 | 0 | 1 | 1 000 – 955 |
| 0 | 1 | 0 | 954 – 912 |
| 0 | 1 | 1 | 911 – 869 |
| 1 | 0 | 0 | 868 – 830 |
| 1 | 0 | 1 | 829 – 798 |
| 1 | 1 | 0 | 797 – 768 |
| 1 | 1 | 1 | 767 – 0 |